An electronic learning diary

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Medical students are increasingly exhorted to take responsibility for their own learning. This paper describes the development and preliminary evaluation of a computerised student log dubbed the* Electronic Learning Diary. *It is a tool to help students manage their own learning, by making objectives more explicit and encouraging them to record their experiences in a database. Thus a more reflective learning style is promoted. Both staff and students see many advantages in the features offered but an unexpected finding was the lack of computer skills among the undergraduates. The diary was developed within the context of undergraduate medical education, but it has a generic design and there is no reason why it could not be used in other subject areas.

Introduction

Medical education is in the process of great change. At undergraduate level, curricula are currently under major review as a result of recent General Medical Council recommendations. Students are encouraged to assess their own educational needs and to take greater responsibility for their learning. Previous attempts to promote the recording and monitoring of students' activities have included the use of a computerised medical records system to enable students to track their clinical experiences[1], a student diary to study the quality of teaching received by medical students[2] and the use of a database to identify students at risk of poor academic performance[3].

The General Medical Council has produced a document, *Tomorrow's Doctors*[4], which advocates the adoption of a less crowded curriculum and more self-directed learning, with less emphasis on didactic teaching. It is within this context that a university consortium project entitled *Technology based Learning in Medicine: Beyond Courseware* was conceived and funded through the Teaching and Learning Technology Programme to provide a framework within which students can more effectively manage their learning. This framework includes computerised study guides[5], computerised clinical cases and a computer based student log which we have termed the Electronic Learning Diary (ELD), the subject of this paper.

Software development

In arriving at the requirements of an electronic learning diary three functional components were identified:

- broadcast of course objectives;
- record student activity;
- links between objectives and activity.

Around these components a specification was drawn up to meet anticipated student requirements and prototyped using *Paradox*, a database management system (DBMS). This provided a rapid development environment and an excellent test bed, but proved to be less than ideal for wider implementation. There were problems in delivery on a network and we were concerned by the limitation imposed by the need for a full DBMS on every delivery machine. A new version of the software now written in *Visual Basic*, runs as a standalone package under *Microsoft Windows*. It comprises a database that may be accessed via staff and student interfaces. The software for teaching staff is designed for the input of aims, objectives, prerequisites and associated study guides of courses (see Figure 1). This information may be updated or deleted as necessary and access to editing facilities is limited to staff only, through password protection.

The student interface allows the user to record and classify learning experiences by means of unstructured or semi-structured formats such as the patient history record (see Figure 2). This allows the recording of information under a number of subheadings such as history, diagnosis and treatment, and enables the student to produce an orderly report.

Students are able, at any stage, to browse the aims and objectives of any course. Recorded experiences can be linked to the objectives of one or many courses. The student can view a graphical representation of the number of links that have been made to the objectives of individual courses (see Figure 3), thus identifying objectives which have not been met. A word search facility enables

Further information

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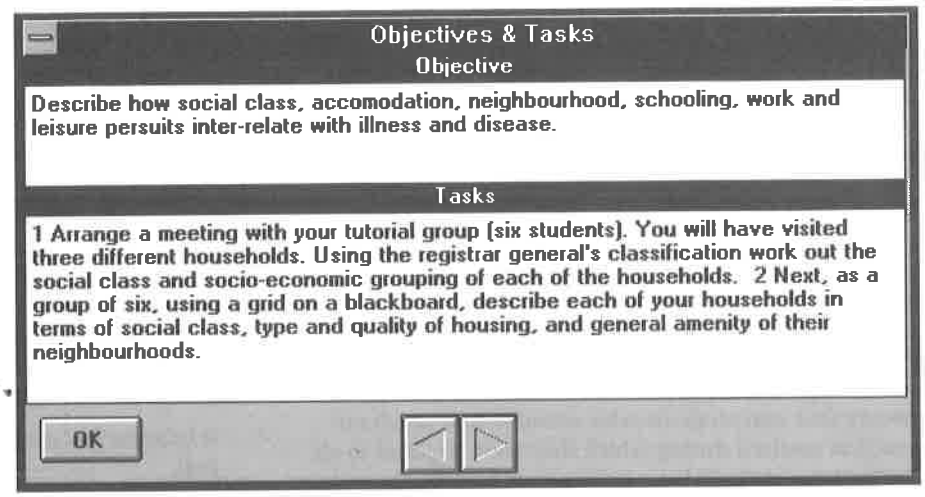

Figure 1: Editing the objectives of a course

the student to retrieve lists of recorded learning experiences that match a particular phrase. This powerful facility allows the student to retrieve any notes where a given phrase occurs. An example of this might be finding those notes containing the words Multiple Sclerosis. The same feature can be used to search through the database of course objectives. There are facilities for students to define their own personal goals and objectives and to record skills they have mastered. Achievements such as examination results and external awards can also be logged.

In essence the main ideas behind the Electronic Learning Diary (ELD) are that students should have ready access to the details of the courses they are taking, and that they should be able to record and classify each and every learning experience they are exposed to such as: lecture, practical, home visit, library, CBL. They then use the system to make links between these recorded experiences and the objectives of one or many courses. Specific areas of study that require more attention can thus be identified. Using word searches will allow the student to explore material he or she has recorded, as well as investigate where certain topics are covered in the curriculum.

Proponents of paper based logs have maintained that logbook writing promotes better thinking by students, and allows them to learn more about themselves and the course[6]. We anticipate that the Electronic Learning Diary should also demonstrate such benefits. It has the potential to reinforce student habits to systematically record relevant data for purposes of future recall and reference, and serve as a stimulus for discussion between student and tutor. Using the ELD, students have a repository for experiences gathered in the various parts of the course. They are able to classify these experiences themselves, reflect on their relevance, and subsequently search for them when reviewing their progress. The greater potential of the computer to make use of the data stored and cross reference it should lead to further benefits in terms of students integrating their learning in both a horizontal and vertical fashion throughout the entire curriculum.

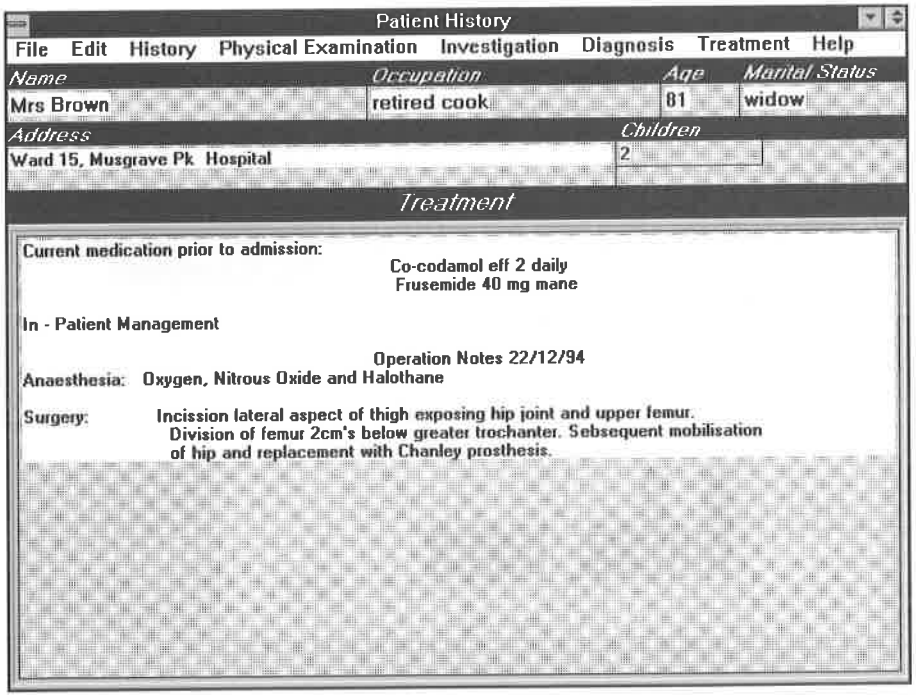

Figure 2: Recording a patient history using a semi-structured format

Method of evaluation

Preliminary evaluation of the prototype took two main forms. Firstly, during the actual development it was felt useful to demonstrate the system to small groups of second year medical students and invite their comments. This was done using semi-structured questionnaires where students were asked to comment on the system's ease of use and its usefulness. Some student comments resulted in minor changes to the system mainly in the area of user interface. This iterative process of development - demonstration - further development we termed formative evaluation. The second type was a summative evaluation and involved twenty first year students who attended four one hour practical sessions during which they were exposed to all the features of the ELD by giving them activity sheets to work through. During this time the students were asked to browse through details of courses, record several learning experiences they had encountered such as patients they had seen or lectures they had attended, make links to appropriate course objectives, collect printed reports of selected information and carry out word searches. In the final session the students were given a more detailed questionnaire to complete which addressed both the functionality and the user interface. They were asked to comment on the visual clarity, consistency, compatibility, feedback, explicitness, appropriate functionality, and flexibility and control of the system's design. Two Medical Education lecturers led round table discussions with students to obtain more general feedback of their impressions. This was video recorded to ensure reliable capture of their comments. Following a suggestion that the ELD would be more relevant in later years, a group of six final year students was also invited to use the software and canvassed for their opinions. The ELD, therefore, had exposure to small groups of first, second and final year students at this University. It is hoped that when the software becomes more widely available, feedback will be obtained from students using it at other institutions.

Student feedback

In general, students found the ability to select a course and browse through its aims and objectives of great value, as such information is not easily accessible by other means. Many students volunteered that using the ELD forced them to *think more* about what they had learned. An illustration of this was that some found it challenging to make links between a specific tutorial they were writing up and the objectives of the course. This should mean that a more active learning style will be encouraged. It also means that students may start calling into question the relevance of some of the teaching! Interesting comments included:

'It helps me find out how far I have progressed and how well.'

'It means that I will spend time actually doing something that is relevant and will make sure that no course objectives are ignored.'

'It helps me to realise the important details of a learning experience.'

Feedback from first year students was limited by their lack of experience both in university education and in IT. Final year students were able to see more clearly how the Electronic Diary could be used to build up an extensive portfolio of learning over the undergraduate years. They pointed out that clinical subjects, which have a great need to integrate knowledge from a variety of sources throughout the curriculum, would benefit most from the ELD but they also highlighted the problem of lack of adequate access to hardware.

During the evaluation period, ten members of staff attended a workshop during which they were familiarised with the facilities of the ELD and the work required to make this tool effective. The software was complimented on its design and potential educational benefits, although concern was expressed about the suitability of the system for non-clinical subjects. In general, staff did

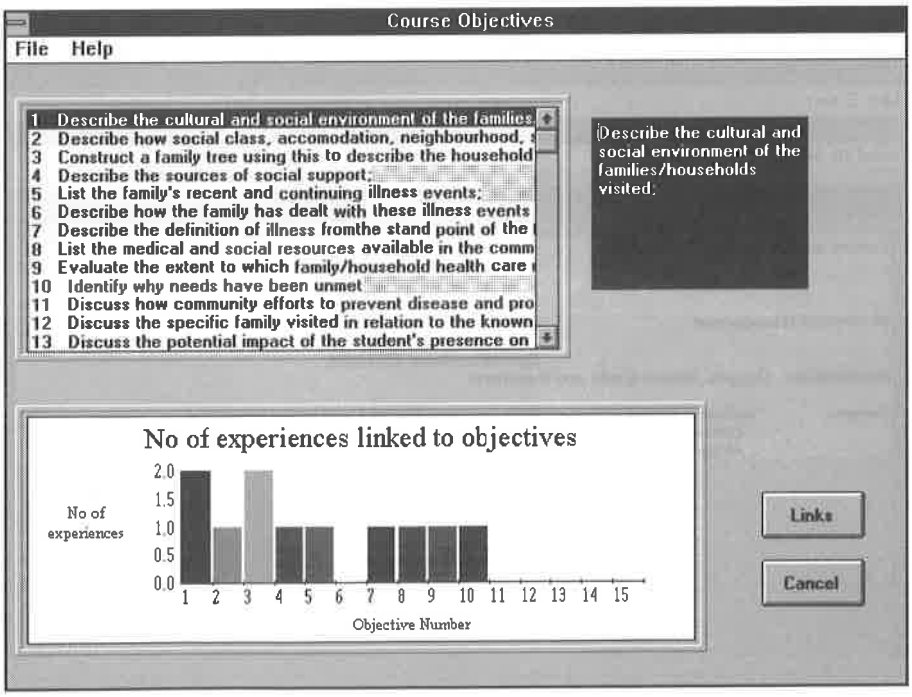

Figure 3: Viewing the links between learning experiences and course objectives

not view the task of inputting course details as problematic, although it is difficult to foresee how willing members of staff will be to update and maintain this information base. The issue of access to equipment was addressed though, unfortunately, unresolved.

Conclusions

The Electronic Learning Diary is a new tool which aims to promote more active student centred learning. Both staff and students can see a role for the ELD in the new medical curricula that are emerging but the anticipated benefits will only stand a chance of being truly demonstrated after a period of prolonged and comprehensive use. Students found access to course structures, aims and objectives the most appealing feature, a comment reflecting the current inadequate state of information supplied to students! Contrary to expectation, medical students were found to have limited IT and keyboard skills that restricted their ability to make full use of the recording facilities. This was reflected in comments such as *'I lose my train of thought as my typing skills are so weak'*. We feel that the ELD will prove most useful in an *experience rich* learning environment. In medical school this applies more to clinical subjects with its apprentice style approach than to the basic medical sciences, which tend to have a more didactic style.

Although a wide cross section of students have been canvassed, the numbers are too small to form an opinion as to whether the students would actually use the ELD on a regular basis. This will depend, to a large extent, on how much curriculum information is actually represented within the ELD and, therefore, is also reliant on how much potential teaching staff see in the system. Our impression is that senior clinical students can see a greater potential than their more junior colleagues.

Evaluation of such prototype systems with students is difficult for several reasons. Questions remaining unanswered include: Where in the software development cycle should evaluation take place? How can students be expected to comment on interface design when they have little to compare with? How can we involve students in such evaluations when their time is limited?

The issue of objectively demonstrating learning benefits is even more problematic. Undoubtedly the ELD approach will suit some students' learning styles better than others. To obtain meaningful feedback will require widespread use over a significant period. Linking student performance to use of the ELD might not be possible. However, with time, the extent of students' enthusiasm to use the ELD may be our only measure of its usefulness as an aid to study.

Much work still needs to be done to make sure students are in a position to benefit from technological innovations such as described in this paper. This includes training in basic IT skills as well as making hardware more accessible. It is intended that further facilities will be made available from within the ELD such as links to other resources eg CAL, study guides and curriculum information. It is hoped that these, and the incorporation of personal diary features such as *to do* lists and an address book will make the software more attractive to students. We feel the Electronic Learning Diary has a future in enhancing the learning experience of students whatever their discipline.

Acknowledgements

The authors wish to extend their thanks to the Scottish Higher Education Funding Council for supporting the Teaching and Learning Technology Programme (TLTP) and to the National Council for Educational Technology (NCET) for their financial assistance in the evaluation component reported in this paper.

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